

REMARKS

The present Amendment and Response is intended to be fully responsive to all points of objection and/or rejection raised by the Examiner and is believed to place the application in condition for allowance. Favorable reconsideration and allowance of the application are respectfully requested.

Applicant asserts that the present invention is new, non-obvious and useful. Prompt reconsideration and allowance of the claims are respectfully requested.

Status of the Claims

Claims 1, 4-5, 13 and 15 are pending in the application. Claims 1 and 4-5 have been amended for clarity purpose. Applicants assert that the amendments are fully supported by the specification of record and add no new matter.

Claims 2-3, 6-12, 14 and 16-20 have been cancelled.

Telephonic Interview

Applicants would like to thank the Examiner and her Supervisor for granting a telephonic interview with Applicants' representative, Dr. Yuanmin Cai (Reg. # 56,513), on June 12, 2007 to discuss the present application. Applicants presented arguments with regard to 35 U.S.C. §112, 2nd paragraph, rejections and 35 U.S.C. §103(a) rejections of claims 1 and 13. During the interview, the Examiner's Supervisor advised that Applicants amend the claims as necessary (to overcome 35 U.S.C. §112, 2nd paragraph, rejections) and the Examiner will reconsider the above rejections in view of the arguments presented and explained by Applicants during the interview.

Remarks to Claim Rejections

Claim Rejections - 35 USC §112

The Office Action rejected claims 1 and 13 under 35 U.S.C. §112, 2nd paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. In particular, the Office Action alleges

that the phase “said impurity content” in both claim 1 and 13 is not clear.

Applicants would like to point out that the phase “said impurity content” refers to, at least in claim 13 in its previously presented form, the impure copper seed layer, which is specifically recited in the last sentence of the previously presented claim 13.

In addition, Applicants have amended claims 1 and 4-5 for clarity purpose and to address the 35 U.S.C. §112, 2nd paragraph, rejection. Amended independent claim 1 now clearly indicates that the said impurity content (“said first impurity content”) refers to the impure copper seed layer. Applicants have made no amendment to claim 13.

Applicants respectfully assert that the amendments of claims 1 and 4-5 are fully supported by the specification of record, and add no new matter.

Claim Rejections - 35 USC §103

The Office Action rejected claims 1, 4-5, 13 and 15 under 35 U.S.C. §103(a), as being obvious over Andricacos et al. (US 6,709,562).

According to MPEP 2142, in order to establish a *prima facie* case of obviousness, the prior art reference (or references when combined) must teach or suggest all the claim limitations. Applicants respectfully submit that prior art reference Andricacos does not rise to the threshold as required by MPEP 2142 in order to establish a valid obviousness rejection.

Specifically, Andricacos does not teach, suggest, or imply the impurity content of the impure copper seed layer as being not more than 1.20% by weight and not less than or equal to 0.001% by weight, as specifically recited by claim 13 and amended claim 1. The Office Action contends that Andricacos teaches the above feature of claims 1 and 13 in col. 2, lines 60-67. However, Applicants have analyzed the prior art and found that col. 2 lines 60-67 describes impurity content of the impure copper fill (“conductor”) and not the impure copper seed layer. Applicants’ above argument is further evidenced by the fact that the conductor (of Andricacos) is “formed by electroplating from a bath containing additives” (col. 2, lines 66-67) because a seed layer is normally formed by sputtering and

not by electroplating as is well known in the art.

Furthermore, Applicants would also like to point out that Andricacos does not describe material composition of the impure copper seed layer as being substantially the same as material composition of the impure copper fill, as specifically recited by claims 1 and 13, and it is not obvious for a person skilled in the art to use the same material composition. This is because the impure copper source in its form of an electroplating bath (used in electroplating the impure copper fill) cannot be used as a sputtering target in forming the seed layer. The present invention teaches electroplating the impure copper source to first create a sputtering target and then use the created sputtering target to form the seed layer. It is respectfully submitted that prior art references of record, including Andricacos, alone or in combination, do not teach, suggest, or imply creating a sputtering target from the electroplating bath and use the sputtering target to form the seed layer. Neither the prior art references teach, suggest, or imply that doing so would reduce the cost of making the product, which is rather counter-intuitive when compared with using the readily available pure copper.

In addition, prior to the present invention, it was generally believed in the industry that impurities in the seed layer shall be avoided due to concerns of possibly causing reliability issues such as corrosion. In other words, it was believed that the purer the copper the better for the seed layer. Therefore, it was not obvious and counter-intuitive, at the time of the present invention, for a person skilled in the art to use the same impure copper source, as impure as that used for the copper fill, to make the seed layer.

In view of the above, Applicants respectfully submit that claims 1 and 13 are not obvious over Andricacos and other prior art references of record, and are patentable.

Claims 4-5 depend from claim 1 and claim 15 depends from claim 13. Claims 4-5 and 15 include all the distinguishing elements of claim 1 or claim 13 as described above, as well as other distinctive features and/or elements. Therefore, claims 4-5 and 15 are patentable for at least the reasons as discussed above with regard to claims 1 and 13.

In view of above remarks, Applicants respectfully request that rejections of claims 1, 4-5, 13 and 15 under 35 U.S.C. §103(a) be withdrawn.

Conclusion

In view of the preceding remarks, Applicants respectfully submit that all pending claims are now in condition for allowance. Favorable reconsideration and allowance of the claims are respectfully requested.

No fees are believed to be due in connection with this paper. However, if there is any such fee due, please charge any such fee to the deposit account No. 09-0458.

Respectfully submitted,

/Yuanmin Cai/

Yuanmin Cai, Ph.D.
Agent for Applicant
Registration No. 56,513

Dated: June 14, 2007

INTERNATIONAL BUSINESS MACHINES CORPORATION

Intellectual Property Law Department, East Fishkill
2070 Route 52, Bldg-321, Zip-482
Hopewell Junction, NY 12533
Tel: (845) 894-8469
Fax: (845) 892-6363